Date of Issue:
17 July 2014

SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

Product Identifier

SRM Number: 691
SRM Name: Reduced Iron Oxide
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is intended primarily for use in evaluating chemical methods and in calibration associated with optical emission and x-ray spectrometric methods of analysis. A unit of SRM 691 consists of 100 g of powder (–200 mesh).

Company Information

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

Telephone: 301-975-2200
FAX: 301-948-3730
E-mail: SRMMSDS@nist.gov
Website: http://www.nist.gov/srm

Emergency Telephone ChemTrec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Classification

Physical Hazard: Not classified.
Health Hazard: Not classified.

Label Elements
Symbol
No symbol/no pictogram

Signal Word
No signal word.

Hazard Statement(s): Not applicable.

Precautionary Statement(s): Not applicable.

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: Iron oxide, reduced.

Component Designations: Iron powder (Ferrium; iron dust; Fe)

The material contains other components listed as oxide compounds on the Certificate of Analysis but are not freely available in the iron ore. Components are listed in compliance with OSHA's 29 CFR 1910.1200. This material may also contain trace amounts of nickel, chromium and cadmium compounds.

Component	CAS Registry	EC Number (EINECS)	Nominal Concentration (%)
Reduced Iron Ore, powder	n/a	n/a	100
Individual Components			
Iron powder	7439-89-6	231-096-4	84.6
Iron oxide	1309-37-1	215-168-2	6.2
Silicon as silicon dioxide	7631-86-9	231-545-4	3.7
Aluminum as aluminum oxide	1344-28-1	215-691-6	1.2
Titanium as Titanium dioxide	13463-67-7	236-675-5	0.3

4. First Aid Measures

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash skin with soap and water.

Eye Contact: Flush eyes with water for at least 15 minutes. If necessary, seek medical attention.

Ingestion: If adverse effects occur after ingestion, seek medical treatment.

Most Important Symptoms/Effects, Acute and Delayed: May cause irritation.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek medical attention if needed.

5. Fire Fighting Measures

Fire and Explosion Hazards: Negligible fire hazard. Avoid generating dust. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media:

Suitable: Regular dry chemical, carbon dioxide, water, regular foam.
Unsuitable: None listed.

Specific Hazards Arising from the Chemical: None listed.

Special Protective Equipment and Precautions for Fire-Fighters: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 1 Fire = 0 Reactivity = 0

6. Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures: Any accumulated material on surfaces should be removed and properly disposed of. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

Methods and Materials for Containment and Clean up: Collect spilled material in appropriate container for disposal. Keep out of water supplies and sewers. Keep unnecessary people away, isolate hazard area and deny entry.

7. Handling and Storage

Safe Handling Precautions: Minimize dust generation and accumulation on surfaces. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. See Section 8, "Exposure Controls and Personal Protection". Avoid contact with incompatible materials (see Section 10, "Stability and Reactivity").

Storage: Store and handling in accordance with all current regulations and standards.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits			
Components	**OSHA (PEL)**	**ACGIH (TLV)**	**NIOSH (REL)**
Iron powder	No occupational exposure limits established.		
Iron (III) oxide	TWA: 10 mg/m^3 (fume) TWA: 15 mg/m^3 (total dust) TWA: 5 mg/m^3 (respirable fraction)	TWA: 5 mg/m^3 (respirable fraction)	TWA: 5 mg/m^3 (as Fe, dust and fume) IDLH: 2500 mg/m^3 (as Fe, dust and fume)
Silicon dioxide	TWA: 20 mppcf TWA: (80/(% SiO_2)) mg/m^3	No occupational exposure limits established.	TWA: 6 mg/m^3 IDLH: 3000 mg/m^3
Aluminum oxide	TWA: 15 mg/m^3 (total dust) TWA: 5 mg/m^3 (respirable fraction)	TWA: 1 mg/m^3 (respirable fraction, related to Aluminum insoluble compounds)	No occupational exposure limits established.
Titanium dioxide	TWA: 15 mg/m^3 (total dust)	IDLH: 5000 mg/m^3	No occupational exposure limits established.

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye/Face Protection: Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

Skin and Body Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE: The physical and chemical data provided are iron powder, the main component of this SRM. No physical or chemical data are available for the reduced iron oxide. The actual behavior of the material may differ from the individual components.

Descriptive Properties:	**Iron powder**
Appearance (physical state, color, etc.)	white to gray powder
Molecular Formula	Fe
Molar Mass (g/mol)	55.85
Odor	not available
Odor threshold	not available
pH	not available
Evaporation rate	not available
Melting point/freezing point	1535 °C (2795 °F)
Density:	not available.
Vapor Pressure	4.24×10^{-9} mmHg at 25 °C
Vapor Density (air = 1)	not available
Viscosity (cP)	not available
Solubility(ies)	water: insoluble
Partition coefficient (n-octanol/water)	not available
Particle Size	<75 µm

Thermal Stability Properties	Iron powder
Autoignition Temperature	not available
Thermal Decomposition	not available
Initial boiling point and boiling range	2750 °C (4982 °F)
Explosive Limits, LEL (Volume %)	not available
Explosive Limits, UEL (Volume %)	not available
Flash Point	not available
Flammability (solid, gas)	not available

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

Stability: X Stable _____ Unstable

Possible Hazardous Reactions: None listed.

Conditions to Avoid: Avoid generating dust. Avoid heat, flames, sparks, and other sources of ignitions. Avoid contact with incompatible materials.

Incompatible Materials: Metals, metal carbide, oxidizing materials, reducing agents and peroxides.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Thermal decomposition will produce miscellaneous compounds.

Hazardous Polymerization: _____ Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: X Inhalation X Skin _____ Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: May cause irritation.

Potential Health Effects (Acute, Chronic, and Delayed)

Inhalation: May cause irritation.

Skin Contact: May cause mechanical irritation.

Eye Contact: May cause irritation or eye damage.

Ingestion: May cause irritation.

Numerical Measures of Toxicity

Acute toxicity: Not classified.

Iron powder: Rat, Oral LD50: 30 g/kg
Iron (III) oxide: Rat, Oral LD50: >10 g/kg
Silicon dioxide: Rat, Oral LD50 >5000 mg/kg; Rabbit, Dermal LD50 >2000 mg/kg;
Rat, Inhalation LC50 >2.2 mg/L (1 h)
Aluminum oxide: Rat, Oral LD50 >5000 mg/kg
Titanium dioxide: >10 g/kg

Skin corrosion/irritation: No data available.

Serious eye damage/eye irritation: No data available.

Respiratory sensitization: No data available.

Skin sensitization: Not classified.
May contain trace amounts of nickel, chromium and cobalt.

Germ Cell Mutagenicity: No data available.

Carcinogenicity: Not classified.

Listed as a Carcinogen/Potential Carcinogen _____ **Yes** _X_ **No**

Iron powder, iron (III) oxide, silicon dioxide, and aluminum oxide are not listed by OSHA, IARC, or NTP as carcinogens/potential carcinogens.

Titanium dioxide is listed by IARC as Group 2b, *possibly carcinogenic to humans*; however titanium dioxide is not freely available in the ore and the mixture is not classified.

Reproductive Toxicity: No data available.

Specific Target Organ Toxicity, Single Exposure: No data available.

Specific Target Organ Toxicity, Repeated Exposure: No data available.

Aspiration hazard: Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data: No data available for this material.

Persistence and Degradability: No data available.

Bioaccumulative Potential: No data available.

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Not regulated by DOT or IATA.

15. REGULATORY INFORMATION

U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	No
CHRONIC HEALTH:	No
FIRE:	No
REACTIVE:	No
PRESSURE:	No

State Regulations:

California Proposition 65: Not listed.

U.S. TSCA Inventory: Iron powder, iron (III) oxide, silicon dioxide, aluminum oxide, and titanium dioxide are listed.

TSCA 12(b), Export Notification: Not listed.

Canadian Regulations: WHMIS Information is not provided for this material.

16. OTHER INFORMATION

Issue Date: 17 July 2014

Sources: ChemADVISOR, Inc., SDS, *Iron Powder,* 21 March 2014.

ChemADVISOR, Inc., SDS, *Ferric Oxide Red,* 21 March 2014.

ChemADVISOR, Inc., SDS, *Silicon Dioxide,* 21 March 2014.

ChemADVISOR, Inc., SDS, *Aluminum Oxide,* 21 March 2014.

ChemADVISOR, Inc., SDS, *Titanium Dioxide,* 21 March 2014.

Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EC50	Effective Concentration, 50 %	RM	Reference Material
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transportation Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration, 50 %	STEL	Short Term Exposure Limit
LD50	Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average
NIOSH	National Institute for Occupational Safety and Health	UEL	Upper Explosive Limit
NIST	National Institute of Standards and Technology	WHMIS	Workplace Hazardous Materials Information System

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at http://www.nist.gov/srm.